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ABSTRACT

This paper examines the theoretical difficulties inherent in basing social investment decisions solely on considerations involving the additional tax payments and tax receipts the investment generates. Although the conceptual issues raised are quite general and could be applied to a wide variety of government financed investments, emphasis is on application to manpower training programs. Following the introductory section, major topics discussed are Some Elementary Concepts in Public Project Analysis (a review), The Case of Manpower Training, and An Assessment of Tax Based Ratios. It is concluded that the use of any tax based cost/benefit ratio is conceptually invalid in that these ratios do not serve as adequate proxies for the net increase in socially useful output received through manpower training programs and they discriminate quite arbitrarily among people based on personal characteristics and other factors that have little relation to the question of economic efficiency. (HD)

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A CRITIQUE OF TAX BASED COST/BENEFIT RATIOS

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A. Introduction

In this paper[1], I examine the theoretical difficulties inherent in basing social investment decisions solely on considerations involving the additional tax payments and tax receipts the investment generates. It has often been suggested that it may be appropriate to evaluate the social costs of government investments by the tax payments required to finance the investment and to value the social benefits by the tax receipts that result from the additional income attributed to the investment. Although the rationale for this view is rarely stated explicitly, it is an idea that reappears periodically under different guises. It can apparently command strong support within the federal government. Because the policymakers directly concerned with overseeing programs are employed by the federal government, there is a natural inclination to highlight those receipts that pass through the budgetary process. If policymakers see themselves as representing the interests of the taxpayer, the appeal of an idea that is motivated by a desire that taxpayers receive a fair return of their tax dollar is understandable. The conceptual issues raised here are quite general and could be applied to a wide variety of government financed investments, but I will concentrate on its application to manpower training programs. To state the question more precisely, I will investigate the conditions under which the true social cost/benefit ratio is related to a cost/benefit ratio where costs are defined only as the tax dollars used to finance manpower programs and benefits are defined as the tax receipts from the net earnings gains due to the manpower program. Referring to the first ratio as A and the second ratio as B, under what conditions would B approximate A? As a corollary to this issue is the question as to where any inconsistencies between the two ratios lie.

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[1]This paper was written under a personal services contract from the ASPER Division of the Department of Labor. The views expressed are those of the author and in no way involve the Rand Corporation or the Department of Labor. I would like to thank William Gould and Ernst Stromsdorfer for their comments and assistance.

Beginning with the Manpower Development and Training Act of 1962, the commitment of the federal government to train and equip low skill workers with new skills accelerated. This commitment expanded so rapidly during the sixties that by 1968 President Johnson proposed to Congress a two billion dollar manpower budget. The actual programs have taken many forms among which the Job Corps, Neighborhood Youth Corps, Work Experience and Training programs are the more prominent. But all have had the common objective of attempting to permanently alter the income prospects of low skill workers either through increased familiarity with the work environment or by directly enhancing their marketable skills. Partly due to their use in other sectors of the government, especially the military, there was almost immediate pressure on the policymakers involved to employ the techniques of cost/benefit analysis in choosing among alternative manpower programs. It is by now generally accepted that some type of cost/benefit calculus is a conceptually appropriate criterion on which to judge the social usefulness of these public expenditures. But many issues concerning the appropriate method of computing these ratios[2] remain hotly debated topics. The list of items that should be included as either costs or benefits, the assignment of prices that measure the true social values of the included costs and benefits, and the correct discount rate to use in comparing dated costs and benefits have all come under careful theoretical scrutiny. Conceptual errors on any of these matters can lead policymakers to distribute their budgetary resources in an economically inefficient manner. This paper represents an attempt to assess a particular method of computing a cost/benefit ratio (i.e. one that uses tax payment and receipts) to determine whether it would lead to a socially efficient allocation of resources.

The success of manpower training programs can be judged on grounds other than economic efficiency. These programs are in part an income transfer designed to alter the distribution of well being by increasing

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[2]Cost/benefit ratios are used here as in the title as a generic term for all techniques that involve comparing costs and benefits. It is not meant to connote a particular method of conducting that comparison.

the relative wealth of low skilled labor. They differ from a straight cash transfer since the receipt of the subsidy is conditioned on participation in a training program. The rationale for the condition is presumably to induce an individual to increase his human capital (wealth) so that his new wealth position becomes self-sustaining and permanent. Since it is fundamentally an attempt to alter the distribution of income, considerations of equity in addition to economic efficiency are introduced. However, the equity issue will be ignored here for a number of reasons. First, the standard caveat applies that an economist speaking as an economist has no special skills to offer for the normative judgments that equity questions entail. Second, as a practical matter for any desired redistribution of income, it is usually possible, and indeed preferable, to achieve that redistribution in an economically efficient manner. Third, the use of a cost benefit ratio based on taxes passing through the government can obviously have different distributional consequences than one based on other criteria. However in view of the underlying philosophy justifying any cost benefit calculation, it would seem curious to choose between alternative ratios on any criterion other than economic efficiency. Moreover, it has not been demonstrated that the use of a tax based ratio would systematically tend to favor one group relative to another. Throughout this paper I will only consider the efficiency aspects of these programs. Thus, I invoke the assumption that the value of a dollar to individual A is the same as the value to individual B. This is the common assumption in all cost/benefit and welfare analysis, but it need not be correct. It is left to one's imagination to determine how we should value the dollars differently.

B. A Review of Some Elementary Concepts in Public Project Analysis

The best way of isolating the advantages or disadvantages of using a tax based cost/benefit ratio is to review some elementary but fundamental concepts pervasive to all social investment analysis. An appreciation of these simple concepts makes the job of critiquing the tax based ratio relatively straightforward. In reviewing these ideas, we will derive the correct method of comparing manpower programs as an ideal from which the tax based technique can be judged. The basic problem in all project analysis

including manpower programs is devising a standard that enables us to compare public investment projects with one another (or with present consumption). In the treatment that follows, there is no pretense of originality or innovation. These notions have been developed by others and are now well embedded in the literature. They do represent the clearest thinking on these matters that I could find.

If economic efficiency is our goal, we want to select for any given cost, that set of projects producing the greatest increase in socially useful output. To some extent, this decision is similar to that faced by a private firm in choosing its investment strategy, including its investments in the human capital of its workers. But a number of complications makes the choice among public investments more difficult. Competitive firms can usually equate values with observable market prices. Output prices are reasonable proxies for per unit benefits and input prices are good measures of costs. However, it is not generally true that market prices reflect social benefits and costs. Discrepancies between social and private values (market prices) can emerge as a result of government taxes and subsidies, market imperfections, indivisibilities of public goods, monopoly power, or unappropriable benefits or costs (externalities). The essence of all project analysis is to identify the relevant costs and benefits connected with a project and to place the correct societal prices on them. Once these have been identified and valued, a rule is required by which we can compare alternative projects with different costs and benefits. One important component of this involves calculating the social rate of discount.

Economists have a precise definition of costs that often is not understood in common usage. Economists define social costs as <u>opportunity costs</u> - the value placed on the best foregone alternative. For example, the cost of employing resources in any industry is the maximum output these resources would have produced in the next best alternative industry. Budgetary or fiduciary costs and market prices do not always correspond to opportunity costs. The favorite example of a distinction between budgetary costs and social costs was the manpower costs of the military when the draft was in effect. Individuals were coerced into the armed forces and paid wages well below what they could have earned in the civilian sector. Measured by the taxes necessary to pay draftee wages, the budgetary costs of military manpower was low. However, the social costs valued at the foregone civilian

output of draftees were enormous. In the transition from the draft to the volunteer system, there took place a large expansion in budgetary costs. At the same time there undoubtedly was a reduction in social costs since many potential draftees with relatively high foregone civilian opportunities did not volunteer. Of course the low budgetary costs had behavioral consequences in affecting the input mix of resources in the military and the budgetary decisions of Congress. It would not have been correct to use taxes or budget costs to value the social costs of the military.

Similarly, market prices can fail to reflect social values. Probably the most important distortions that exist result from taxes. From a worker's point of view, he is interested in the wage he receives net of income taxes. It is this wage that governs the allocation of his scarce time. From a societal viewpoint, it is the gross wage that measures the social value of his labor. The division of payment of his social value between himself and other taxpayers is of no importance when computing the social value.

As these examples illustrate, the correct measure of costs and benefits is a function of whose perspective we take. For manpower programs, there are three main viewpoints; (1) the social view where costs are opportunity costs and benefits are the alternative uses of the additional skills produced; (2) the private view (that of the trainee) where the only costs that are relevant are those that he bears and the benefits are his additional after tax income; and (3) the government or taxpayer's view where the costs are the taxes required to pay for the program and the benefits are the additional tax receipts therefrom. That these three viewpoints can diverge motivates much of the controversy in analyzing public projects. In particular, in this paper we are interested in how well the governmental perspective approximates the social one. The existence of taxes alone means that we must distinguish between the value to individuals and the value to society. Once we have properly valued costs and benefits, we need a rule which will array projects in terms of the highest net value.

Perhaps the central issue debated in public project analysis during the 1950's and early 1960's involved the selection of a rule by which projects should be ranked. Three main candidates emerged. It was argued

that one should choose the project (1) with the highest internal rate of return, (2) that had the highest net present value, (the present value of net benefits associated with the project discounted at the social discount rate), (3) where the ratio of the present value of benefits to costs was largest. By now a consensus has been reached that rule number two (selecting the greatest Net Present Value) is under quite general conditions the correct one to follow. Since Hirshleifer's classic article, it is well known that the internal rate of return contains mathematical as well as economic difficulties.[3] The internal rate of return is defined as that discount rate which equates the present value of benefits from a project to the present value of its costs. The mathematical problem is that the internal rate of return need not be unique. The complete series of costs and benefits extending into period N constitutes a polynominal equation of degree N. By Descartes rule of signs, the maximum number of real roots of a polynominal is determined by the number of sign changes in the polynominal. If net benefits become negative in any time period after the first positive net benefit, then we may be confronted with an aoundance of riches - more than one internal rate. There is no solution to the problem of which rate to choose. The economic deficiency with an internal rate is more fundamental. Implicitly, one is assuming when one uses the internal rate that the dollar benefits received in the early periods can be reinvested at the internal rate. For example, if the internal rate is 40 percent, there must be other investment opportunities available that yield 40 percent so that the dollars accruing during the first benefit period of this project can have a return of 40 percent until the end of the project. If the market interest rate is 10 percent, this will simply not be true. Consider two mutually exclusive public investment opportunities with the first costing $1000 and yielding $500 per year forever. Let the second project cost $3000 with returns of $1000 per year. The internal rate of return on the first project is 50 percent and on the second project it is 33 percent. The higher internal rate criteria tells us to opt for project one but this could easily be a mistake. At market interest rates below 25 percent (a quite likely occurence), the second project has a larger net present value than the first.

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[3] See "The Optimal Theory of Investment," Journal of Political Economy, August 1958.

Similar difficulties exist when one uses benefit/cost ratios. The benefit/cost ratio is computed by first calculating the present value of benefits and the present value of costs associated with the project. Next a simple ratio of the present value of benefits to the present value costs is calculated. In the case of mutually exclusive investments, one is supposed to select the project with the largest ratio.[4] However, this rule can also lead to socially inefficient resource allocation. Consider again the two projects discussed above. At an interest rate of 10 percent (the social opportunity costs of funds), the social value of the additional output from project one is $4000 and from project two is $7000. Clearly project two is preferred. But the computed benefit/cost ratio is approximately 5 for project 1 and 3.3 for project 2. These simple examples illustrate why the net present value rule is superior to either the internal rate of return or benefit/cost ratio rules.

One reason why the internal rate of return proved to be so popular and was abandoned only reluctantly is that it is a self-contained statistic. One could compute an internal rate with data only on the costs and benefits associated with the individual project. Unlike the net present value rule, no assumption was required concerning the social discount rate.[5] The social rate of discount has been (and to some extent still remains) one of the more controversial subjects involving public project appraisal. Quite distinguished economists have suggested a number of discount rates with an embarrassingly large range. Since the choice between 4 percent or 10 percent discount rate could determine the acceptance or rejection of many projects, policymakers were understandably reluctant to employ a rule where the magnitude of one of the key parameters was in such dispute. However, whether we use government taxes or some other method to measure costs and benefits, there is no way of avoiding the question of an appropriate discount rate. The social discount rate issue is no different than refusing to place a value on the materials or labor used in manpower programs.

It is instructive to briefly examine the calculation of the "true" social discount rate because it illustrates two important components of all cost benefit analysis: (1) the distortions that may exist between private

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[4] If projects were not mutually exclusive and there was no capital rationing, one would undertake all projects with benefit/cost ratios exceeding 1.

[5] A social rate would be necessary as the cutoff point for selecting projects.

and social costs, and (2) the creation of shadow prices. The social discount rate should in principle measure the value of alternative uses of the funds used for the manpower program. Because of the manpower investment, some private consumption or private investment that would have occurred is displaced. If there were no distortions in the private capital market, the existing market interest rate would measure the value of the foregone private consumption and investment.[6] Distortions do exist with one of the more important due to the presence of corporate and personal income taxes. The corporate income tax is a tax on capital in the corporate sector and as such it creates a wedge between the social and private return on investments in the private sector. From the point of view of the managers of corporations and their stockholders, it is the after tax yield on their investment that is relevant in their decision making. However, from the societal perspective the before tax return on private capital measures the social value of the investment. It is irrelevant socially that some of the returns of private sector investments are distributed to stockholders and some to the public at large through increased tax payments of corporations.[7] For example, the same level of public expenditures and services could be maintained with a reduced payment of all other personal and corporate income taxes. Since a 6 percent private return on corporate investment translated into approximately a 12 percent social return, the private investment foregone should be discounted at 12 percent.

Not all the funds required for manpower programs are absorbed by reduced private sector investment. Some of the manpower expenditures replace private consumption. The before tax corporate return cannot be used to measure the value of this private consumption foregone. Rather what is required is the subjective marginal rate of substitution between present and future consumption. An adequate proxy for the consumer's discount rate on future consumption is the return of bonds net of all personal income taxes. If an individual with a marginal income tax rate of 33 1/3 percent purchases a bond that yields 6 percent, he is willing to forego one dollar today (of

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[6] In reality, at any moment of time there exists numerous interest rates. I am ignoring this complication in order to make a basic point simply in the text.

[7] The reader should be reminded of the caveat regarding my ignoring interpersonal utility comparisons. Under any other assumption we would have to consider the distribution of the benefits between members of society.

present consumption) if it yields a 4 percent return (increased future consumption).[8] Thus, the correct discount rate to use on that proportion of the manpower costs that replace private consumption would be 4 percent.

The complete picture is illustrated in Figure 1. Curves AA and A'A' represent the before and after tax marginal efficiency of capital respectively. Curves BB and B'B' are the before tax and after tax private savings functions. The market interest rate is r_o, the before tax return on corporate capital is r_1, and the discount rate for future consumption is r_2. The institution of manpower training valued at DE dollars shifts out the total investment curves to CC and C'C'. This reduces private investment by DF and increases savings by FE. The foregone private investment is represented by the shaded area under the before tax marginal efficiency of capital and the foregone private consumption by the shaded area under the B'B' curve. The appropriate shadow discount rate becomes a weighted average of the before tax corporate return on capital and the after tax rate of savings where the weights are the proportion of capital costs that come out of private investment and private consumption.

More formally, one can show that the shadow discount rate is

$$r^* = \left[\frac{w_1}{1-T} + w_2 \, (1 - t) \right]$$ where T is the corporate income tax rate, t is the personal income tax rate and w_1 and w_2 are the proportion of capital costs that come from planned investment and consumption. Furthermore, $w_1 = \frac{-\eta}{\Sigma-\eta}$ and $w_2 = \frac{\Sigma}{\Sigma-\eta}$ where η and Σ are the interest elasticity of the investment and savings function.

C. The Case of Manpower Training

Using these principles and economic efficiency as the only goal, we should select all projects that have a positive net present value. If projects are mutually exclusive so that the selection of one eliminates the other, the project with the highest net present value is preferred. Furthermore, the social discount rate to use in calculating net present values is also knowable - it is the weighted average of the social return on capital

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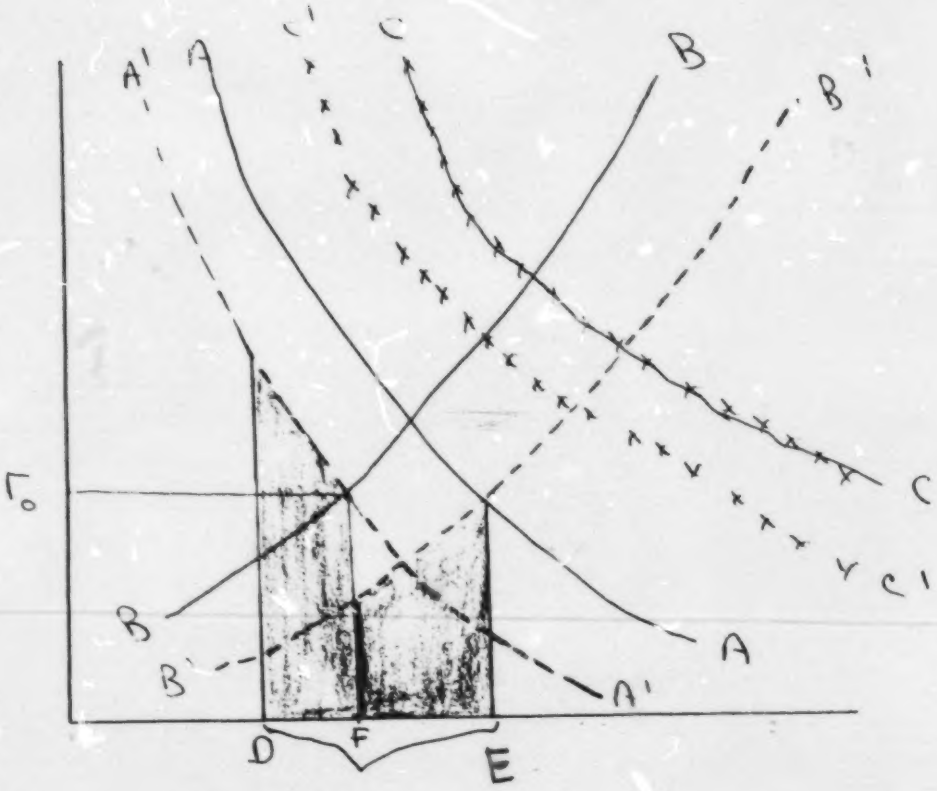
[8] Because of the great variation in effective marginal tax rates among individuals, this can in practice become a difficult measurement problem. In principle one would want to value each dollar of foregone present consumption by the personal marginal rate of substitution of present for future consumption of the individual who gave up that dollar. Except perhaps for some gross adjustments for groups with large differences in tax rates, this would soon become unmanageable.

FIGURE 1



AA	Before tax marginal efficiency of capital (without manpower investment)
A'A'	After tax marginal efficiency of capital
BB	Before tax savings function
B'B'	After tax savings function
CC	Before tax marginal efficiency of capital (with manpower investment)
C'C'	After tax marginal efficiency of capital (with manpower progress)
r_o	Market rate of interest
DE	Total manpower investment
DF	Foregone private investment
FE	Foregone private consumption

and the marginal rate of substitution between present and future consumption. If this discount rate is employed and the net present value rule is followed, the social value of the return from manpower programs would be maximized. All that remains is to enumerate and value all the factors that should appear as either social costs and benefits of these programs.

Table 1 lists the major costs and benefits of manpower programs from three perspectives; the social, private and governmental or budgetary view. The basic social return from manpower programs is the increased earning capacity of the trainee. The purpose of training is to impart skills to workers so that their human capital will be larger.[9] In this respect manpower training is no different than any other form of human capital investment - a commitment of resources in the current period in the hope that this will yield additional earnings in the future. Note again one should recognize that it is the earnings before all income taxes that comprises the social return. Federal income taxes, and all social security taxes contributed by both the employer and employee are part of the social output due to training. From a social efficiency standpoint the distribution of this output between the trainee and the general public through any structure of tax revenues is unimportant. That is simply a question of the distribution of output and not its total value. In principle, one should include any increase in the non-pecuniary benefits associated with the job as part of the social return. In practice, the measurement problems are so severe that these are usually ignored. Of more consequence, the monetary value of all fringe benefits of the new job (above those received in the old job) can be a large part of the social return. Since fringe benefits are strongly positively correlated with skill level, neglecting them could lead to a serious underestimation of the net present value.

Conceptually, social costs are also easy to identify. The social costs are all the resources foregone as a consequence of training. These

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[9] There are many other reputed returns from manpower training that are neglected here. These involve third party effects - those increases in social welfare that are not captured by the trainee or the government in the form of higher taxes. Since people other than trainees receive these benefits, they will not appear as higher trainee earnings. These externalities include reduced crime, better neighborhoods, etc. While they may be real components of the social return, they are ignored here because they will not affect any of the alternative cost/benefit ratios discussed in the text. All of them will underestimate social returns if third party effects are present.

TABLE 1

SOCIAL, PRIVATE, AND GOVERNMENTAL

MANPOWER PROGRAM COSTS AND BUDGETS

GROUP INVOLVED		COSTS	BENEFITS
Social		Earnings foregone of trainees Opportunity costs of all resources used in teaching and training Administrative Costs	Increase in before tax earnings of trainees due to program
Private		Loss in after tax earnings during training Direct training expenses paid by trainee (transportation, books, etc.) Minus (plus) the increase (decrease) in transfer payments during training	Increase in after tax earnings of trainees minus the decrease in transfer payment due to being a successful trainee
Government	Narrow Definition	Taxes necessary to pay direct costs of programs	Additional federal income taxes (including social security taxes paid by employee and employer) on incremental earnings due to training
	Broad Definition	Narrow definition plus taxes lost because of trainee foregone earnings during training Plus (minus) the increase (decrease) in transfer payment during training.	Narrow definition plus additional state and local income and sales taxes on additional income minus reduction in all transfer payments to sucessful trainee

include (1) the alternative value of all resources connected with administering manpower programs, (2) the value of all resources (teachers, capital, equipment, etc.) employed in the training process, and (3) the foregone earnings or opportunities of the trainees themselves. The first two components are relatively transparent. The resources used in administration and training could have been employed elsewhere. The cost of using them for manpower training is the largest value of the output foregone. Moreover for these costs, market prices will usually serve as an adequate proxy for their worth.

A less obvious part of the social costs are the foregone opportunities of trainees. One of the fundamental insights of human capital theorists was the observation that for many types of investments in people - education, on the job training and the like - foregone earnings of the human investors are likely to be a large fraction of the total investment costs. Instead of attending school, individuals could be working. The loss of these potential earnings is a legitimate part of the cost to the individuals and to society of schooling. In fact, most studies by economists of the costs of education and on-the-job-training indicate that foregone earnings are the major part of the total investment cost. For those individuals who would have worked, their before tax potential market earnings should be added to the administrative and material costs to calculate the total social costs.

A complication arises with manpower programs because many of the participants were not working before joining the program. Some are officially unemployed, some are new entrants into the labor force with no previous work experience, and some are housewives. None of these groups have market earnings to forego at the time of program entry. Although the measurement problems are considerably more difficult, the opportunity cost notion applies to these persons as well. It is now commonplace in economics to recognize that the time value of women not engaged in market work is positive and compares favorably with the value of time of working women. Because the use of an hour of a housewife's time in one non-market activity implies that her time cannot be employed in another non-market activity, her time is scarce and valuable. Similarly, new labor market entrants and even the unemployed are using their time in activities that have value. Empirically, it would be necessary to impute a

value to the time of such individuals, and recently a number of statistical techniques have been developed for that purpose. It would clearly be grossly inaccurate to assume that it is zero. Conceptually then the computation of social costs and benefits of manpower programs is not that complex. The additional before tax earnings of trainees represent the benefits; the costs are all the resources involved in administration and training evaluated at their market prices plus the before tax foregone earnings of individuals who would have worked instead of being trained. For those who would not have worked, their imputed shadow wages can be used as a substitute for market earnings.

Although this paper is not concerned with the private return to training, it may clarify some issues to distinguish the private and social return. One crucial distinction results from taxes. On the benefit side the trainee considers only the after tax income he receives. He does not include in his return any of the additional taxes that were a legitimate component of the social return.[10] The private cost to the trainee is the decline in his after tax income during the training period. If a trainee's before tax earnings were $5000 and his average tax rate was 20 percent, the cost to him of engaging in training is $4000. We must add to these after tax foregone earnings all the direct costs of training paid by the trainee (books, transportation, etc.). Finally, transfer payments are included in the private cost even though they are not part of the social cost.

An easy way to distinguish an economist from the bureaucrat is to ask them how they would handle transfer payments. Their distinct treatment of these funds illustrates clearly the economist's use of the opportunity cost concept. Manpower training will typically induce a complex series of reactions in the entire public transfer system. Initially, this may consist principally of subsistence payments to trainees during the training period. Following training, there may be lower welfare and unemployment compensation received by successful trainees. There is a temptation for those in control of the Federal budget, and the general public as well, to view the increased transfers during training as a cost and the lower future transfers as a

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[10] One qualification involves social security taxes. If an individual's future expected social security receipts are related to the taxes he pays into the social security system, then some part of these taxes are included in the private return. There is real question about how firm the link is between current contributions and future receipts in this program. This is a controversial area that is beyond the scope of this paper.

benefit. From an economic perspective, these transfers constitute neither real social costs or benefits. Economic costs exist if real resources (that have alternative uses) are used in the process. Economic benefits are present if the set of obtainable output from a given amount of resources is increased. Straight transfers do not qualify since there is no absorption of resources caused by the payment of additional subsistence during training and no enlargement of resources due to the lowered future compensation. The gain to taxpayers of a dollar reduction in future welfare payments is matched by the loss of a dollar to the trainee. Socially, the net effect is zero.[11] Taken alone, the exchange of dollars can be a misleading indicator of the existence of benefits and costs. Dollar payments are useful when they measure incentives to transfer resources at their opportunity costs. It is not the dollar payment but the use of the resource that constitutes the opportunity costs. With the exchange of dollars between individuals through the political process, no resources are lost.[12] The larger consumption opportunities of one member are offset by the lower consumption possibilities of another. The trainee sees things quite differently. These transfers can easily alter the private return to training. The trainee will subtract from his future perceived benefits the expected decrease in all public subsidies. Any new public dollars received during the training process will lower the private cost to him of undertaking training.

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[11] A number of qualifications of this statement can be mentioned. First, there are typically administrative costs of processing these transfers. If there is a reduction in administrative costs as transfers are reduced, there is a social benefit. Second, many of these payments are not pure transfers. Rather, they are conditioned upon certain aspects of an individual's behavior like the absence of market work. By distorting incentives the transfers could have produced welfare costs. If the number of people involved in transfer system is reduced, there may be a social benefit.

[12] This statement should not be taken too seriously. In political process where allocation decisions are made, resources are used. Because there are competitors for the dollars that are distributed, individuals are willing to incur costs to receive some of the benefits. So these considerations which are part of the new economics of politics are ignored here.

The final perspective I consider is that of the government. It is this view that argues for tax based cost/benefit ratios. Those who favor a tax based ratio seem to be asking the following question - will the taxpayer receive a fair return on his tax dollars used for manpower training? The taxpayer's return is the additional tax receipts on the larger earnings of trainees; the government expenditures on manpower training are his costs. At least two issues create ambiguity: (1) should any induced effects on government expenditures or taxes be counted; (2) should tax benefits and costs to governmental units other than the Federal government be considered? A narrow definition includes in the benefits the tax revenue from the additional earnings and as costs the direct government expenditures in training workers. This definition is narrow since it ignores all induced changes in government expenditures and taxes that are a predictable consequence of manpower training. The induced change in expenditures consist principally of the lower expected transfer payments in the future and the larger transfer payments of other Federal government agencies during training. Whether those who favor a tax based cost/benefit ratio would include these induced effects in their calculations depends upon the underlying philosophy that motivates the tax based ratio. The narrow view treats each Federal program as a distinct entity whose direct costs and expenditures should be justified by the new Federal taxes these expenditures induce. On the other hand, if the Federal taxpayer is taken as the unit upon whom benefits and costs are computed, some might argue that all the induced changes in Federal expenditures are on a par with the direct manpower expenditures. That is, a dollar increase in tax receipts from the new earnings is equivalent to a dollar decrease in Federal unemployment benefits. This takes the Federal budget itself as sacrosanct. The argument against considering these induced changes in federal expenditures is that they are simple transfers. If the trainee himself is thought of as a member of society, the dollar reduction in unemployment insurance that was a gain to "taypayers" is a loss to him.

Another unsettled issue involves the governmental units one should include in the tax accounting. Although manpower programs are Federally funded, their existence will inevitably have an impact on the taxes collected and expenditures made by many other levels of government. Most directly, the additional earnings caused by federally financed manpower training will be

subjected to state and local income taxes. More indirectly, states and localities will gain new revenues from sales taxes as the larger earnings are used for the consumption of goods and services. There are losses incurred as well. During the training period, local and state income taxes will decline to the extent that there are trainee foregone earnings (hence no longer taxable). And, as we saw at the Federal level, there can be indirect effects on the amount of governmental expenditures. Many state and local transfer payments, i.e. unemployment compensation, welfare payments, may be reduced in the future due to the enhanced earning capacity of successful trainees. Similarly there could be increases in some of state and local transfer payments during the training period.

From an overall governmental perspective, the larger state and local income taxes due to the higher earnings of trainees are a legitimate part of the total returns from training. The lost personal income tax revenues of these local units during the training period are part of the social costs of these programs. Since the potential before tax income measures the foregone social opportunities, sales tax revenues are not counted since this income was already included in the after personal income tax income of trainees. The reduced transfer payments (welfare, unemployment compensation) after training and any new transfer payments during training by any governmental unit do not represent social costs or benefits. As we have just seen, the benefit or cost to the trainee is offset by a cost or benefit to the taxpayer.

Whether state and local income taxes are relevant depends once again on whether an exclusively Federal view is taken. Manpower programs will probably increase local taxes in the communities where the trainees work. People in these communities may or may not be indifferent to a dollar increase in state income tax receipts or Federal income tax. State and local taxes may be more acceptable to them than federal taxes if the benefits received are more closely tied to local tax payments. Of course, residents of California are unlikely to be sanguine about the higher taxes received by residents of New York State because of the Federally funded manpower programs in New York.

D. An Assessment of Tax Based Ratios

After this somewhat elaborate introduction, evaluating the usefulness of tax based cost/benefit ratios is a straightforward task. The

criterion by which we will judge any tax based ratio is whether it ranks manpower projects by their social net present values. A tax based ratio will be deficient and lead to sub-optimal decisions if it produces reversals in the ordering of projects. This will be especially severe if it alters the sign of the social net present value of certain types of projects. We know that the correct method of computing the social net present value is to count as the benefits the increase in before tax earnings of trainees that are a direct consequence of training. The social costs are all the resources employed in training valued at their foregone opportunities - administrative costs, direct expenditure costs of government (materials, teachers, rental value of capital equipment) and the foregone earnings of trainees. Using the symbols explained in Table 2, the social net present value (SNPV) may be expressed as follows:[13]

$$SNPV = -(y_o + D) + \frac{Y}{r}$$

Before comparing the SNPV with a tax based one, three aspects of the government viewpoint raised earlier must be resolved: (1) the inclusion of all indirect government expenditures induced by manpower training, (2) the place of state and local governments, (3) and the tax losses due to lower foregone earnings of trainees. It would be conceptually incorrect to have these induced changes in government expenditures in the tax based ratio. The primary reason is that these expenditures are typically transfers that do represent net costs or benefits to society. These payments will arbitrarily inflate benefits for groups with the largest induced reductions in future transfers. If these transfers are included, the tax based ratio will tend to favor such groups and lead to a socially inefficient selection of projects. Although the additional state and local taxes are

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[13] This obviously involves a number of simplifications. First, an assumption that all costs occur instantaneously at time zero. On the benefit side, it assumes a constant earnings gain for all future years and an infinite life. These assumptions are employed not because they describe the actual cost and benefit consequence of manpower programs, but simply because they simplify the mathematical presentation. None of the substantial points made in the text would be changed if the formulas more realistically described the actual process.

TABLE 2

A Short Glossary of Symbols

y	Increase in after tax income of trainees as a consequence of training
y_o	Foregone earnings of trainees during training
D	Direct costs of training = administrative and all costs associated with training except foregone earnings
r	Social discount rate
t	Tax rate
NPV	Net present value
SNPV	Social net present value
$GNPV^1$	Tax based net present value excluding lost tax receipts
$GNPV^2$	Tax based net present value including lost tax receipts

part of the social return to those projects, this does not necessarily imply that state and local taxes should be in the tax based ratio. Since a tax based ratio considers only part of the benefits and costs in any case, the issue is whether incorporating the state and local taxes makes these ratios better approximations of the true SNPV. I will demonstrate below that there are instances in which adding state and local taxes gives a closer approximation to the social value and cases in which it makes matters worse.

The third issue concerns whether one should count on the cost side the decline in government taxes during the training period. One can conceive of a tax based ratio that adds the loss in income tax receipts to direct expenditures. In what follows, I will investigate the properties of two types of tax based ratios. The difference between them is simply that one of them will add the lost income tax receipts to the cost of manpower training. In general, we cannot determine whether either of these tax

base ratios understates or overstates the SNPV. Taking the ratio which ignores the loss in tax receipts during training, the net present value is

$$GNPV^1 = -D + t\frac{y}{r}$$

This method leaves out a cost - the foregone earnings of trainees - and simultaneously deflates the benefits by the tax rate. It treats the three elements comprising the SNPV quite differently. On the cost side, all the direct costs are counted dollar for dollar, but foregone earnings are completely ignored. On the benefit side, only a fraction of the benefits appear. Not surprisingly, this ratio does not match very closely the SNPV of projects. GNPV would equal SNPV by pure happenstance if the capitalized value of the future increase in after tax income equaled the foregone earnings component of costs. If the capitalized value of the additional after tax income is larger than foregone earnings, $GNPV^1$ is less than SNPV. Adding in state and local taxes will obviously make $GNPV^1$ larger relative to SNPV. But since $GNPV^1$ could have exceeded or fallen short of SNPV, we cannot determine whether including state and local taxes makes matters better or worse.

The second tax based ratio is

$$GNPV^2 = -D - ty_o + t/\frac{y}{r}$$

Since this ratio differs from the first only in that we have another cost, $GNPV^1$ is greater than $GNPV^2$. This ratio treats the benefits and foregone earnings costs symetrically since they are both deflated by the tax rate. However, the two types of costs are weighted differentially. Direct cost are dollar for dollar, but foregone earnings are only a fraction on the dollar. Once again we cannot state a priori if this second tax base ratio exceeds or is less than the SNPV. The two net present values are the same when the present value of social benefits is just offset by the foregone earnings.[14] Because the SNPV of a project will be positive only when the benefits cover at least the foregone earnings costs, $GNPV^2$ can be employed as a conservative discriminator. Any project with a positive $GNPV^2$ must necessarily have a positive SNPV, although a negative $GNPV^2$ does not imply a negative social value. However, if we had two mutually exclusive

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[14] $$SNPV - GNPV^2 = \left(\frac{y}{r} - y_o\right) 1-t$$

projects with positive $GNPV^2$, it would not generally be correct to select the one with the higher $GNPV^2$. $GNPV^1$ can not be used even in this limited sense - its sign does not supply information about the sign of SNPV. If $GNPV^2$ is used, state and local taxes should be included for an increase in the tax rate drives the social value and $GNPV^2$ closer together. The conservative rule with $GNPV^2$ (accepting only positive values) adds to the number ber of correctly chosen projects when state and local taxes are counted. The difficulty with this ratio is that it does not treat the two types of costs symetrically. Direct expenditures are fully counted while only a fraction of the foregone earnings costs are entered. This tends to tip the scale towards projects where foregone earnings are a larger part of the total costs.

It is obvious that we cannot rely on either one of these tax based ratios to give the correct signal to the policymaker. Using either ratio, projects that are socially useful can be rejected. Similarly, they can induce us to accept a project that should be rejected. This alone is sufficient to argue against the use of these tax based ratios. But their most serious defects are illustrated by the manner in which they would lead policymakers to discriminate among prospective trainees. The level of benefits with $GNPV^1$ is a simple function of the tax rate faced by the trainee after training. The higher the marginal tax rate on this additional earnings, the larger the benefits. Therefore, for any given level of costs and its distribution between D and y_o, government agencies would tend to select as trainees those individuals with the highest marginal tax rate. Using $GNPV^1$ tends to favor precisely the wrong type of people. Because they are not counted as part of the costs, it discriminates in favor of those with high foregone earnings. It also discriminates for any given increase in income in favor of those who have the highest marginal tax rate.

Strictly followed, $GNPV^1$ will select for manpower programs persons with the highest incomes. Not only will this lead to social inefficiency, its income distributional consequences seem perverse. Since all individuals do not face an identical tax rate schedule, $GNPV^1$ will discriminate on the basis of other personal characteristics in addition to income. The following types of people will be favored; single people relative to married; married families without children relative to those with children, and people with low medical expenses. Such a list could be expanded to reflect any

discriminatory characteristic of the tax system itself.

Another difficulty with the tax based ratio is that all social benefits that escape the tax system will not appear in these ratios. As soon as items are not registered as taxes, the tax based ratio will not rank correctly. On the cost side, the major omission will be the foregone opportunities of those trainees that do not result in lost taxes. The best examples are the trainees who were working housewives, new labor market entrants, or unemployed. The time of such individuals has value and real opportunities are foregone by engaging in training. But since they did not pay any taxes, there is no corresponding cost item in the tax based ratio to match their foregone opportunities. Compared to trainees who would have had market earnings during training, the tax based ratio prefers those whose best opportunity without training is outside the market sector.

Some social benefits also do not pass through the tax system. Some important examples are fringe benefits, with pension plans being the most prominent. Fringe benefits are not taxed when they are earned. In fact this avoidance of income taxes accounts for the spectacular growth in the fraction of income received in this form. Because fringe benefits are as much a part of the income received by workers as their direct current period wages, they should appear in the social return to training. The fraction of total wages paid in the form of fringe increases with skill level. Thus as a consequence of training, workers probably will receive a larger proportionate increase in their fringe wages. The tax based ratio ignores this component of the return and discriminates against those who are trained for occupations with relatively high fringe packages.

There is a special case in which the second tax based ratio will correctly rank projects. This case is relevant if (1) all social costs of manpower programs consist exclusively of the foregone market earnings of workers and (2) there is a constant marginal tax rate with no exemptions. Under these circumstances, the government becomes a partner in the investment sharing in all costs and benefits in a neutral fashion. The net present values of the tax based ratios will simply be proportional to the social net present values with the marginal tax rate serving as the proportionality factor. Since all social NPV are reduced by the same proportion, the tax based ratio will maintain the relative ranking of all projects. Furthermore,

no project with a positive social NPV could have a negative one with the tax related one. To illustrate, let the social costs of the program be $1000 in foregone earnings and let the social benefits be $200 per year. At a discount rate of ten percent the NPV would be $1000. If individuals faced a marginal tax rate of 20 percent, the tax loses would be $200 and the future tax gains $40 per year with a $GNPV^2$ of $200.[15]

E. Conclusion

Simply stated, the use of any tax based cost/benefit ratio is conceptually invalid. These ratios do not serve as adequate proxies for the net increase in socially useful output received through manpower training programs. They discriminate quite arbitrarily among people based on personal characteristics and other factors that have little relation to the question of economic efficiency. Moreover, they would have perverse equity effects as well tending to favor those whose wealth is high. The government tax receipts represent only a fraction of the benefits that result from such training. The direct budgetary costs similarly measure at best only some of the costs of these programs. Since costs and benefits are not reduced proportionally, there can easily be reversals in the proper ordering of public investments when tax based ratios are used. The reason why tax based ratios lead us astray is that taxes per se are neither costs nor benefits. Taxes fundamentally are transfers. They are collected from some individuals in society and given to others as government expenditures. Since the collection of a tax does not reduce the real resources of society,[16] it is not surprising that tax based ratios are of little use for social planning.

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[15] More generally, $SNPV = -y_o + \frac{y}{r}$ and $GNPV^2 = -ty_o + t\frac{y}{r}$ to that $GNPV^2 = (t)SNPV$.

[16] I am obviously ignoring here any welfare costs due to the altering of incentives.